United Nations ECE TRANS/WP.29/GRPE/2018/14

Economic and Social Council

Distr.: General
26 March 2018

Original: English

Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

Working Party on Pollution and Energy

Seventy-seventh session
Geneva, 6-8 June 2018
Item 3(a) of the provisional agenda
Light vehicles: Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M_1 and N_1 vehicles), 101 (CO_2 emissions/fuel consumption) and 103 (Replacement pollution control devices)

Proposal for a new Supplement to the 06 and 07 series of amendments to UN Regulation No. 83 (Emissions of M1 and N1 vehicles)

Submitted by the expert from the International Organization of Motor Vehicle Manufacturers*

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to clarify the rules related to the selection of driving modes for testing of Off-Vehicle Charging Hybrid Electric Vehicle (OVC-HEV) vehicles with a mode selection switch. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21 and Add.1, Cluster 3), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.18-04556(E)

Please recycle

I. Proposals

A. A new Supplement to the 06 series of amendments

Paragraphs 2.23. and 2.23.1., amend to read:

"~~2.23. "Bi-fuel vehicle" means a vehicle with two separate fuel storage systems that is designed to run on only one fuel at a time. The simultaneous use of both fuels is limited in amount and duration.~~

~~2.23.1. "Bi-fuel gas vehicle" means a bi-fuel vehicle that can run on petrol (petrol mode) and also on either LPG, NG/biomethane, or hydrogen (gas mode).~~

2.23. "*Bi-fuel vehicle*" means a vehicle with two separate fuel storage systems that is designed to run primarily on only one fuel at a time; however the simultaneous use of both fuels is permitted in limited amount and duration.

2.23.1. "*Bi-fuel gas vehicle*" means a bi-fuel vehicle where the two fuels are petrol (petrol mode) and either LPG, NG/biomethane, or hydrogen."

Paragraph 5.3.1.2.4., amend to read:

"5.3.1.2.4. During the test the exhaust gases are diluted and a proportional sample collected in one or more bags. The exhaust gases of the vehicle tested are diluted, sampled and analysed, following the procedure described below, and the total volume of the diluted exhaust is measured. Not only are the carbon monoxide, hydrocarbon and nitrogen oxide emissions recorded, but also the particulate pollutant emissions from vehicles equipped with compression-ignition engines **and direct injection petrol engines**."

Annex 7, paragraph 7.4.4.3., amend to read:

"7.4.4.3. At the request of the manufacturer an alternative purge ~~tst~~ **test** procedure can be used, if the procedure has been presented to and has been accepted by the Technical Service during the type approval procedure."

Annex 8, paragraph 3.2.1., amend to read:

"3.2.1. Start of engine, start of the sampling and the operation of the first cycle shall be in accordance with ~~Table 1~~ **Table A4a/1** and Figure A4a/1 in Annex 4a to this Regulation."

Annex 14, paragraph 3.1.1., amend to read:

"3.1.1. Two tests shall be performed under the following conditions:

Condition A: Test shall be ~~carried out~~ **started** with a fully charged electrical energy/power storage device.

Condition B: Test shall be ~~carried out~~ **started** with an electrical energy/power storage device in minimum state of charge (maximum discharge of capacity).

The profile of the State of Charge (SOC) of the electrical energy/power storage device during different stages of the Type I test is given in Appendix 1."

Annex 14, paragraph 3.2.1., amend to read:

"3.2.1. Two tests shall be performed under the following conditions:

3.2.1.1. Condition A: Test shall be ~~carried out~~ **started** with a fully charged electrical energy/power storage device.

3.2.1.2. Condition B: Test shall be ~~carried out~~ **started** with an electrical energy/power storage device in minimum state of charge (maximum discharge of capacity)~~.~~ **and carried out with an operating mode keeping the vehicle in charge-sustaining operating condition, that being an operating condition in which the energy/power stored in the energy/power storage device may fluctuate but, on average, is maintained at a neutral charging balance level while the vehicle is driven.**

3.2.1.3. **In agreement with the responsible authority, the following operation modes shall not be considered for the purpose of testing:**

- **Operating modes which are not limited to vehicle propulsion but which, in addition to vehicle propulsion, are charging the energy power/storage device, such as 'charge mode';**
- **Operating modes for vehicle maintenance, such as 'maintenance mode';**
- **Operating modes for special limited purposes and not intended for daily operation, such as 'mountain mode'.**

~~The operating mode switch shall be positi~~ ~~ed according to Table A14/1.~~

~~Table A14/1~~

~~*Hybrid modes*~~ / ~~*Battery state of charge*~~	~~*Pure electric*~~ ~~*Hybrid*~~ ~~*Switch in position*~~	~~*Pure fuel consuming*~~ ~~*Hybrid*~~ ~~*Switch in position*~~	~~*Pu*~~ ~~*fuel*~~ ~~*uming*~~ ~~*rid*~~ ~~*h in position*~~	~~*Hybrid mode n'*~~ ... ~~*Hybrid mode m'*~~ ~~*Switch in position*~~
~~Condition A Fully charged~~	~~Hybrid~~	~~Hybrid~~	~~Hy~~ ~~Fid~~	~~[2]Mostelectric hybrid mode~~
~~Condition B Min. state of charge~~	~~Hybrid~~	~~Fuel consuming~~	~~Fu~~ ~~consuming~~	~~Most fuel consuming mode[3]~~

~~*Notes:*~~

~~[1] For instance: sport, economic, urban, extra-urban position ...~~

~~[2] *Most electric hybrid mode* The hybrid mode which can be proven to h~~ ~~e the highest electricity consumption of all selectable hybrid modes when tested in accordance with condition A of paragraph~~ ~~of Annex 10 to Regulation No. 101, to be established based on information provided by the manufacturer and in agreement w~~ ~~h the technical service.~~

~~[3] *Most fuel consuming hybrid mode* The hybrid mode which can be prove~~ ~~to have the highest fuel consumption of all selectable hybrid modes when tested in accordance with condition B of paragraph~~ ~~of Annex 10 to Regulation No. 101, to be established based on information provided by the manufacturer and in agreement w~~ ~~h the technical service.~~

3.2.1.4. The operating mode shall be selec d as described in paragraphs 3.2.1.4.1. to 3.2.1.4.2.2. inclusive.

3.2.1.4.1. Operating mode selection for Conditio A

3.2.1.4.1.1. If there is a single operating mode nder condition A that is always selected when the vehicle is switched o regardless of the operating mode selected when the vehicle was previous y shut down, and which cannot be switched to another mode without an ntentional action of the driver or be redefined, this single operating moc shall be selected.

3.2.1.4.1.2. If there is no single operating mode nder condition A that is always selected when the vehicle is switch d on, the most electric energy consuming mode shall be selected.

3.2.1.4.2. Operating mode selection for Conditi B

3.2.1.4.2.1. If there is a single operating mode nder condition B that is always sele ted when the vehicle is switched o regardless of the operating mode selected when the vehicle was previou y shut down, and which cannot be switched to another mode without a ntentional action of the driver or be redefined, this single operating mo e shall be selected.

3.2.1.4.2.2. If there is no single operating mod under condition B that is always selected when the vehicle is switched on, the most fuel consuming mode shall be selected."

B. A new Supplement to the 07 series of amendments

Paragraphs 2.23. and 2.23.1., amend to read:

~~"2.23. "Bi-fuel vehicle" means a vehicle with two separate fuel storage systems that is designed to run on only one fuel at a time. The simultaneous use of both fuels is limited in amount and duration.~~

~~2.23.1. "Bi-fuel gas vehicle" means a bi-fuel vehicle that can run on petrol (petrol mode) and also on either LPG, NG/biomethane, or hydrogen (gas mode).~~

2.23. "*Bi-fuel vehicle*" means a vehicle with two separate fuel storage systems that is designed to run primarily on only one fuel at a time; however the simultaneous use of both fuels is permitted in limited amount and duration.

2.23.1. "*Bi-fuel gas vehicle*" means a bi-fuel vehicle where the two fuels are petrol (petrol mode) and either LPG, NG/biomethane, or hydrogen."

Paragraph 5.3.1.2.4., amend to read:

"5.3.1.2.4. During the test the exhaust gases are diluted and a proportional sample collected in one or more bags. The exhaust gases of the vehicle tested are diluted, sampled and analysed, following the procedure described below, and the total volume of the diluted exhaust is measured. Not only are the carbon monoxide, hydrocarbon and nitrogen oxide emissions recorded, but also the particulate pollutant emissions from vehicles equipped with compression-ignition engines **and direct injection petrol engines**."

Annex 7, paragraph 7.4.4.3., amend to read:

"7.4.4.3. At the request of the manufacturer an alternative purge ~~lst~~ **test** procedure can be used, if the procedure has been presented to and has been accepted by the Technical Service during the type approval procedure."

Annex 8, paragraph 3.2.1., amend to read:

"3.2.1. Start of engine, start of the sampling and the operation of the first cycle shall be in accordance with ~~Table 1~~ **Table A4a/1** and Figure A4a/1 in Annex 4a to this Regulation."

Appendix 1 to Annex 11, paragraph 6.5.3.5., amend to read:

"6.5.3.5. When a fault is registered, the manufacturer shall identify the fault using an appropriate ISO/SAE controlled fault code specified in one of the standards listed in paragraph 6.5.3.2.(d) of this appendix relating to "emission related system diagnostic trouble codes". If such identification is not possible, the manufacturer may use manufacturer controlled diagnostic trouble codes according to the same standard. The fault codes shall be fully accessible by standardised diagnostic equipment complying with the provisions of ~~paragraph 6.5.3.2.~~ **paragraph 6.5.3.3.** of this ~~annex~~ **appendix**.

The vehicle manufacturer shall provide to a national standardisation body the details of any emission-related diagnostic data, e.g. PID's, OBD monitor Id's, Test Id's not specified in the standard listed in paragraph 6.5.3.2.(a) of this appendix but related to this Regulation."

Annex 14, paragraph 3.1.1., amend to read:

"3.1.1. Two tests shall be performed under the following conditions:

Condition A: Test shall be ~~carried out~~ **started** with a fully charged electrical energy/power storage device.

Condition B: Test shall be ~~carried out~~ **started** with an electrical energy/power storage device in minimum state of charge (maximum discharge of capacity).

The profile of the State of Charge (SOC) of the electrical energy/power storage device during different stages of the Type I test is given in Appendix 1 to this annex."

Annex 14, paragraph 3.2.1., amend to read:

"3.2.1. Two tests shall be performed under the following conditions:

3.2.1.1. Condition A: Test shall be ~~carried out~~ **started** with a fully charged electrical energy/power storage device.

3.2.1.2. Condition B: Test shall be ~~carried out~~ **started** with an electrical energy/power storage device in minimum state of charge (maximum discharge of capacity)~~.~~ **and carried out with an operating mode keeping the vehicle in charge-sustaining operating condition, that being an operating condition in which the energy/power stored in the energy/power storage device may fluctuate but, on average, is maintained at a neutral charging balance level while the vehicle is driven.**

3.2.1.3. **In agreement with the responsible authority, the following operation modes shall not be considered for the purpose of testing:**

- **Operating modes which are not limited to vehicle propulsion but which, in addition to vehicle propulsion, are charging the energy power/storage device, such as 'charge mode';**

- **Operating modes for vehicle maintenance, such as 'maintenance mode';**

- **Operating modes for special limited purposes and not intended for daily operation, such as 'mountain mode'.**

~~The operating mode switch shall be positioned according to Table A14/1.~~

~~Table A14/1~~

~~*Hybrid modes* / *Battery state of charge*~~	~~*- Pure electric*~~ ~~*- Hybrid*~~ ~~*Switch in position*~~	~~*- Pure fuel consuming*~~ ~~*- Hybrid*~~ ~~*Switch in position*~~	~~*- Pure electric*~~ ~~*- Pure fuel consuming*~~ ~~*- Hybrid*~~ ~~*Switch in position*~~	~~*- Hybrid mode n[1]*~~ ~~...~~ ~~*- Hybrid mode m[1]*~~ ~~*Switch in position*~~
~~Condition A Fully charged~~	~~Hybrid~~	~~Hybrid~~	~~Hybrid~~	~~[2]Mostelectric hybrid mode~~
~~Condition B Min. state of charge~~	~~Hybrid~~	~~Fuel consuming~~	~~Fuel consuming~~	~~Most fuel consuming mode[3]~~

~~*Notes:*~~

~~[1] For instance: sport, economic, urban, extra-urban position ...~~

~~[2] *Most electric hybrid mode.* The hybrid mode which can be proven to have the highest electricity consumption of all selectable hybrid modes when tested in accordance with condition A of paragraph 4. of Annex 8 to Regulation No. 101, to be established based on information provided by the manufacturer and in agreement with the technical service.~~

~~[3] *Most fuel consuming hybrid mode.* The hybrid mode which can be proven to have the highest fuel consumption of all selectable hybrid modes when tested in accordance with condition B of paragraph 4. of Annex 8 to Regulation No. 101, to be established based on information provided by the manufacturer and in agreement with the technical service.~~

3.2.1.4. The operating mode shall be selected as described in paragraphs 3.2.1.4.1. to 3.2.1.4.2.2. inclusive.

3.2.1.4.1. Operating mode selection for Condition A

3.2.1.4.1.1. If there is a single operating mode under condition A that is always selected when the vehicle is switched on regardless of the operating mode selected when the vehicle was previously shut down, and which cannot be switched to another mode without an intentional action of the driver or be redefined, this single operating mode shall be selected.

3.2.1.4.1.2. If there is no single operating mode under condition A that is always selected when the vehicle is switched on, the most electric energy consuming mode shall be selected.

3.2.1.4.2. Operating mode selection for Condition B

3.2.1.4.2.1. If there is a single operating mode under condition B that is always selected when the vehicle is switched on regardless of the operating mode selected when the vehicle was previously shut down, and which cannot be

switched to another mode without an intentional action of the driver or be redefined, this single operating mode shall be selected.

3.2.1.4.2.2. If there is no single operating mode under condition B that is always selected when the vehicle is switched on, the most fuel consuming mode shall be selected."

II. Justification

1. Background: Current legislative text for the mode selection of OVC-HEVs (before amendment)

(a) Annex 14, paragraphs 3.1.1. and 3.2.1. define condition A and condition B under which an OVC-HEV shall be tested according to this regulation.

(b) In addition to the definition of condition A and condition B, Annex 14 paragraph 3.2.1. defines in table A14/1 the positioning of the operating mode switch for an OVC-HEV with an operating mode switch, means which operating mode has to be selected for condition A as well as for condition B.

2. Justification 1 for amendment: Current legislative text opens up room for interpretation

(a) Paragraphs 3.1.1. and 3.2.1. define the conditions and (in the case of an OVC-HEV with operating mode switch) the modes to be selected for condition A and condition B but nevertheless leave a lot of room for interpretation which could lead to physically unreasonable interpretations of the legislation.

E.g. condition B is defined as carrying out the test with an electric energy/power storage system device in minimum state of charge but is not excluding modes which only have the purpose of increasing the state of charge in addition to spend energy for the vehicle propulsion.

(b) Table A14/1 under paragraph 3.2.1. offers specific mode set up vehicle configurations but there is not clear definition of 'pure electric', 'pure fuel consuming', 'hybrid'.

There is therefore the question of whether a 'pure electric' mode is still a pure electric mode when the combustion engine is turning on after kick-down of the accelerator pedal which only is done in case of an emergency or by overtaking a car.

3. Justification 2 for amendment: Current legislative text could lead to unreasonable mode selection for condition B

(a) The operating mode specified in table A14/1 under paragraph 3.2.1. leads, in the case of several hybrid modes, to an unreasonable mode selection according to the right hand column of the table.

(b) In the case that there is a mode which in addition to utilising the fuel energy for vehicle propulsion also uses the fuel energy for charging the electric power/energy storage device, this mode has to be selected.

(c) In the test result, this is reflected in a higher fuel consumption and CO_2 mass emission but on the other hand also in a lower electric consumption.

4. Justification 3 for amendment: Current legislative text is not reflecting the intention of the purpose of condition B

(a) The current text is not clear in case of the mode selection and in addition does not reflect the intention of the legislation concerning the purpose of condition B.

(b) Purpose of Condition B: Condition B shall reflect a charging balance neutral SOC balance which means that it should reflect only the energy used for vehicle propulsion.

(c) Not the purpose of Condition B: Condition B shall not reflect the energy stored in the energy/power storage device for a later use for vehicle propulsion. As such a later use is not reflected in the results, there is no justification to apply a mode which is charging the battery.

5. Proposed amendment:

(a) Legislative text from WLTP has been used as basis and reference for the amendment.

(b) WLTP legislation already in force.

(c) Amendment reflects the intention for condition B testing in a robust and correct way.

(d) Modes for special and limited use special purposes as maintenance modes are being excluded.

(e) Amendment removes the table under paragraph 3.2.1. and replaces it with a clear mode selection guidance.

6. In addition, the amendments to the definitions for bi-fuel vehicles align with the new amendments to the definitions in UN GTR No.15.

The amendment to paragraph 5.3.1.2.4. reflect the fact that particulate pollutant emissions are no longer just measured for compression ignition vehicles.

7. The amendment to paragraph 7.4.4.3. of Annex 7 corrects a typographical error.

8. The amendment to paragraph 3.2.1.of Annex 8 corrects an error that has been in UNR No 83 since Revision 3 in 2005.

9. In 07 Series of Amendments only, the amendment to paragraph 6.5.3.5. corrects a cross-reference error introduced in Amendment 1. That amendment added a new paragraph before paragraph 6.5.3.2. which meant that the requirements in that paragraph became those in paragraph 6.5.3.3., however the reference in paragraph 6.5.3.5. was not updated to reflect this change. In addition Amendment 1 introduced a new error by referring to "this annex" instead of "this appendix".